

An Ultralow Power Fast-Response Nano-TCD CH₄ sensor for UAV Airborne Measurements, Phase I

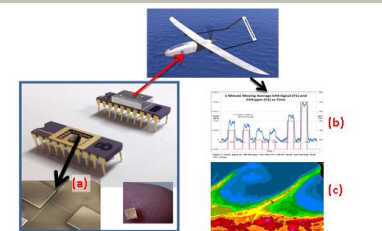
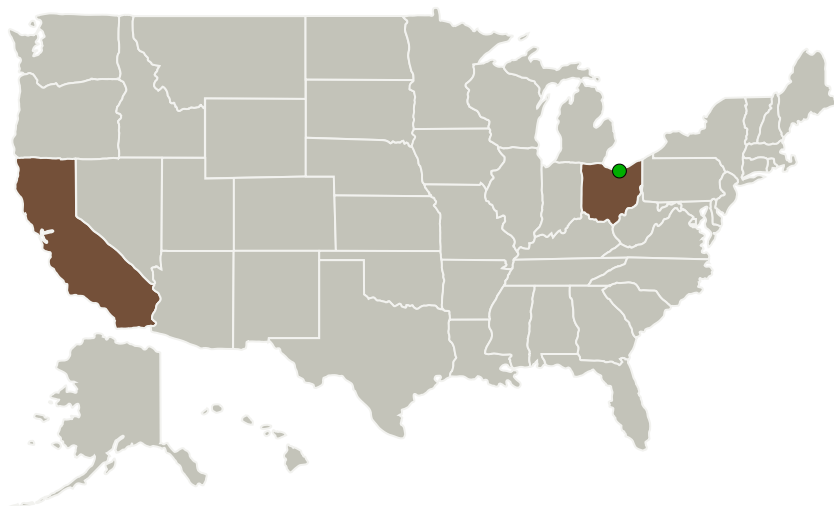
Completed Technology Project (2014 - 2014)



Project Introduction

In this project, KWJ proposes to develop a low power, fast response, lightweight miniature CH₄ measurement system based on KWJ nano-TCD sensor for airborne measurement operation. KWJ has developed patented sub- μ m dimension TCDs, with ultra low power consumption ($<10\mu$ W), $<1\mu$ sec response time, very high stability ($>10^9$ measurements without re-calibration), and coupling with simple electronic circuits and algorithms. In Phase I, KWJ will fabricate nano-TCD CH₄ sensor, improve the sensitivity such that 5ppm accuracy will be obtained, and characterize the sensor on a bench-top testing system to demonstrate CH₄ detection with all target specifications. In Phase II, the prototype sensing system (1cmx1cm, 10g package) will be built and integrated with NASA UAVs for field testing. The proposed sensor will be ideal for airborne gas surveys. This sensor is part of a broader effort to develop smaller, faster, lower power and more cost effective alternative sensors for a wide range of applications. This platform will advance not only the research fields of atmospheric research, climate change, global change biology, and ecology, but for NASA's future spacecraft programs as well as KWJ's own terrestrial-industrial applications. This work has synergy within NASA and can collaborate with ongoing NASA SiC sensor developments in Phase II.

Primary U.S. Work Locations and Key Partners



Low power miniature CH₄ sensor that can be deployed by UAVs for qualitative, quantitative and spatial measurement and mapping of atmospheric gas. (a) 1x50 μ m sensing bridge, (b) example response to 100-500ppm CH₄, (c) example aerial mapping data

An Ultralow Power Fast-Response Nano-TCD CH₄ sensor for UAV Airborne Measurements Project Image

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| Organizations Performing Work | Role | Type | Location |
|-------------------------------|-------------------------|-------------|--------------------|
| KWJ Engineering, Inc | Lead Organization | Industry | Newark, California |
| ● Glenn Research Center(GRC) | Supporting Organization | NASA Center | Cleveland, Ohio |

| Primary U.S. Work Locations | |
|-----------------------------|------|
| California | Ohio |

Project Transitions

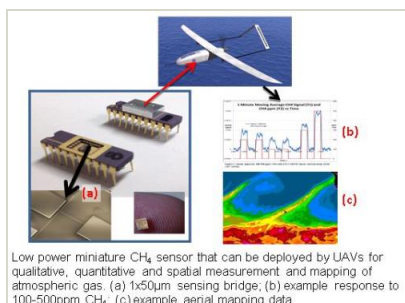
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/137596>)

Images



Project Image

An Ultralow Power Fast-Response Nano-TCD CH₄ sensor for UAV Airborne Measurements Project Image

(<https://techport.nasa.gov/image/131933>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

KWJ Engineering, Inc

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

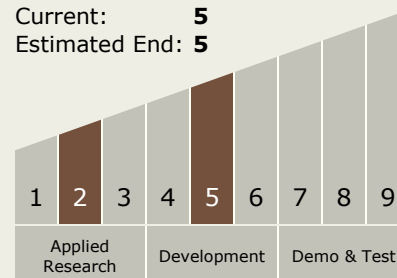
Joseph R Stetter

Technology Maturity (TRL)

Start: 2

Current: 5

Estimated End: 5



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Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.3 In-Situ Instruments and Sensors
 - └ TX08.3.4 Environment Sensors

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System